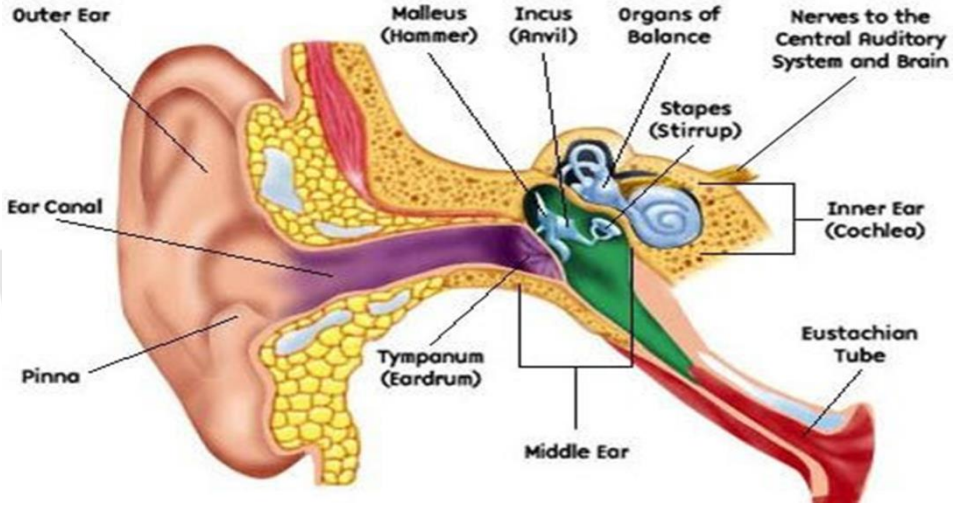
HUMAN EAR

- Hearing or audition is the sense of sound perception and results from tiny hair fibers in the inner ear detecting the motion of a membrane which vibrates in response to changes in the pressure exerted by atmospheric particles within (at best) a range of 20 to 20000 Hz.
- Sound can also be detected as vibrations conducted through the body by tactician. Lower and higher frequencies than can be heard are detected this way only.

- The primary apparatus of hearing i.e., the ear is divided into three parts



1. The outer ear
2. The middle ear
3. The inner ear

1. The Outer Ear

The outer ear serves the function of collecting the sound waves from the environment to the internal portions of the ear. It is shaped like a reverse megaphone .It also plays an important role in locating the sound direction from which it originates. It has following parts.

Auditory Canal

When sound waves originate from the vibrating object, they then pass through the auditory canal,

SHOUT
SHARE
IT

which is a tube like passage through which the sound travels to the inner part of the ear or " the eardrum".

Eardrum

- The part of the ear that starts vibrating when sound waves strike/ hit it.
- Its intensity of vibration is dependent on how intense the sound waves are___ the more intense the sound, the more intensely it vibrates.
- These vibrations are then transmitted to the "middle ear".

2. Middle Ear

•Bones

A tiny chamber between the eardrum and cochlea containing three bones---- the hammer, the anvil, and the stirrup, which transmit vibrations to the oval window.

• These three bones have only one function, i.e. to convey/ transmit the message to the inner ear. These bones are also effective in the sense that they strengthen the stimulus (vibration) so that it can be easily heard. Information (Vibration) Travels Through These Three.

Hammer → Anvil → Stirrup → Oval window

Oval Window

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- A membrane between the middle and the inner ear that increases the strength of the stimulus (vibration) while transmitting them.
- Serves as the amplifier so that tiny or hiss voices could be heard, which otherwise may remain unnoticed.

3. Inner Ear

- The innermost region/ part of the ear that contains important structures such as cochlea, semi circular canals and vestibular sacs, and that changes/ transforms the sound waves into the neural
  impulse. Organs that are present in it help us to determine in locating our position and how we are moving in space.

Cochlea

- In the inner ear, the sound enters into the cochlea___ a coiled, bony tube filled with the fluid that receives information (sound) from the oval window or through bone conduction. The sound waves that reach here help in triggering the nerve impulse.

Basal Membrane

- Inside the cochlea is the basal membrane passing from the middle of cochlea___ a structure that divides the cochlea into the upper and lower chambers/ parts.
- This basal membrane is covered/ surrounded by the tiny hair cells that are bent on the vibration, so that neural message reaches the brain without any hindrance or difficulty; helps to transmit information to the temporal lobe's auditory region.

Another means of hearing sound besides cochlea is through bone conduction. As ear is directly connected with the skull's bones, the cochlea is then able to pick up subtle voices (such as one's own voice). This is largely due to bone conduction. Why one's own voice seems different to one's self than to others is due to this phenomenon. This may also occur because voice reaches one's self through the air and also through bone conduction.

Balance and the Role of Ear

- Several ear structures are related with the sense of balance of the person much more than playing their roles in hearing phenomena
- Three tubes or the semicircular canals (inner ear) contain the fluid that moves when the head moves; the rotational or angular movements are signaled to the brain.
- The semicircular canals contain otoliths that are tiny motion- sensitive crystals. The otoliths can sense the pull on our body exerted by gravity, as well as that by the acceleration of forward, backward, or up-and down motion. When the person moves these crystals also move. Thus the system is familiar with the feeling in case of different moves, and constantly strives for a perfectly balanced position; the otoliths can sense immediately.

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NEURONS: STRUCTURE, FUNCTIONS, TYPES, NEURAL IMPULSE, SYNAPTIC TRANSMISSION. NEUROTRANSMITTERS.

NEURONS

- The neuron or nerve cell is the information-processing and information-transmitting element of the nervous system.

- It is the basic unit of our nervous system and are specialized cells, which possess the unique property of converting various forms of stimuli into electrical impulses.
- They are also specialized for reception, conduction and transmission of information in the form of electrochemical signals.
- They receive information from sense organs or from other adjacent neurons, carry them to the central nervous system (brain and the spinal cord), and bring motor information from the central nervous system to the motor organs (muscles and the glands).

- Nearly 12 billion neurons are found in the human nervous system. They are of many types and vary in shapes, size, chemical composition, and function. Most neurons have, in one form or another, the following four structures or regions:

1. Cell body (Soma)
2. Dendrites
3. Axons
4. Terminal buttons.

SOMA

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- The soma (cell body) contains the nucleus and much of the machinery that provides for the life processes of the cell. The genetic material of the neuron is stored inside the nucleus and it becomes actively engaged during the cell reproduction and protein synthesis. Its shape varies considerably in different kinds of neurons.

DENDRITES

- Dendron is the Greek word for tree, and the dendrites of the neuron look very much like trees.
- Dendrites are branch-like specialized structures emanating from the soma. They are the receiving ends of a neuron.
- Their function is to receive the incoming neural impulses from adjacent neurons or directly from the sense organs. On dendrites are found specialized receptors, which become active when a signal arrives in electrochemical or biochemical form.
- The received signals are passed on to soma and then to axon so that the information is relayed to another neuron.

AXON

- The axon is a long, slender tube, often covered by myelin sheath, which is a fatty covering interrupted at the nodes of Ranvier. It carries information from the cell body to the terminal buttons.
- The transferred excitation is focused by the axon hillock on the axon and carried down the axon to its terminal barbarization at the next set of synapses.
- The basic message it carries is called an action potential.
- When it reaches a point where the axon branches, it splits but does not diminish in size.
- Each branch receives a full-strength action potential.

TERMINAL BUTTONS

- The bud at the end of a branch of an axon, forms synapses with another neuron, sends information to that neuron.
- Terminal buttons have a very special function: when an action potential traveling down the axon reaches them; they secrete a chemical called a neurotransmitter. This chemical either excites or inhibits the receiving cell and thus helps to determine whether an action potential occurs in its axon.
- An individual neuron receives information from the terminal buttons of axons of other neurons, and the terminal buttons form synapses with other neurons.

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